

Claims:

1. An apparatus capable of performing multiple deposition processes, comprising:
a chamber body; and
a gas distribution assembly comprising:
a gas conduit in fluid communication with the chamber body;
two or more isolated gas inlets equipped with one or more high speed actuating valves in fluid communication with the gas conduit, the valves adapted to alternately pulse two or more gases into the gas conduit; and
a mixing channel in fluid communication with the gas conduit, the mixing channel adapted to deliver a continuous flow of one or more compounds into the gas conduit.
2. The apparatus of claim 1, wherein the gas conduit comprises a gradually increasing inner diameter.
3. The apparatus of claim 1, wherein the gas conduit has a frusto-conical shape.
4. The apparatus of claim 1, wherein the mixing channel is in fluid communication with the gas conduit via one or more passageways formed within the mixing channel.
5. The apparatus of claim 1, wherein the gas distribution assembly further comprises a lid plate disposed on the chamber body.
6. The apparatus of claim 1, wherein the gas distribution assembly further comprises an insulating plate disposed on the lid plate.
7. An apparatus capable of performing multiple deposition processes, comprising:
a chamber body; and
a gas distribution assembly comprising:
a gas conduit in fluid communication with the chamber body;
at least two separate flow paths in fluid communication with the gas

conduit at a first end thereof, each isolated flow path having one or more high speed actuating valves; and

at least one annular mixing channel disposed about the gas conduit at a second end thereof, the mixing channel in fluid communication with the gas conduit via one or more passageways formed therethrough;

wherein the flow paths are isolated from the mixing channel by a pressure differential created within the gas distribution assembly.

8. The apparatus of claim 7, wherein the gas distribution assembly further comprises a lid plate disposed on the chamber body, the lid plate having a conical concave lower surface to help evenly distribute gases within the chamber body.

9. The apparatus of claim 7, wherein the gas distribution assembly further comprises a thermal plate disposed on the lid plate.

10. The apparatus of claim 7, wherein the one or more passageways comprises a plurality of nozzles formed within an inner wall of the mixing channel.

11. The apparatus of claim 10, wherein the nozzles are disposed substantially perpendicular in relation to the gas conduit.

12. The apparatus of claim 10, wherein the nozzles are disposed at an angle in relation to the gas conduit.

13. The apparatus of claim 7, wherein the one or more passageways comprises a gap disposed within an inner wall of the mixing channel.

14. The apparatus of claim 13, wherein the gap has a variable height to control fluid flow therethrough.

15. The apparatus of claim 7, wherein the gas conduit comprises a gradually increasing inner diameter from inlet to outlet.

16. A method for depositing multiple layers on a substrate surface by performing multiple deposition processes within a single processing chamber, comprising:
positioning a substrate surface to be processed within a chamber body;
delivering two or more compounds into the chamber body in alternate pulses to deposit a film comprising a first material on the substrate surface; and then
delivering two or more different compounds into the same chamber body to deposit a film comprising a second material on the first material.
17. The method of claim 16, wherein an inert purge gas is delivered continuously with the pulsed compounds.
18. The method of claim 16, wherein the pulses of the two or more compounds are separated by pauses.
19. The method of claim 16, wherein the pulses of the two or more compounds overlap during delivery into the chamber body.
20. The method of claim 16, wherein the second material further reacts with the first material to form a third material.